

WOSS 510/1

British Railways Board

Director of Mechanical and Electrical Engineering

Batteries

Nickel Alkaline

WORKSHOP OVERHAUL STANDARD SPECIFICATION



REVISION RECORD

This Specification will be updated when necessary by the issue of amended pages accompanied by revision letters. The amended or additional part of re-issued pages will be marked with a vertical black line.

If you consider that an amendment is necessary, complete BR Form 14298 and pass it to the local BRB Resident Engineer or Area Quality Engineer. Submission of a form does not authorise the proposed amendments.

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This Specification applies to equipment fitted to the vehicles indicated 'X' below, but it is only to be implemented when authorised by an appropriate maintenance/overhaul document.

LOCOMOTIVES

03	
08	X
09	X
20	
25	
26	X
27	X
31	
33	
37	
43	
45	
47	
50	
56	
58	

73	
81	X
85	X
86	X
87	X
88	
89	
91	

DMU's

101	X
104	
107	
108	X
110	
111	
114	
115	
116	
117	
119	
121	
122	
123	
140	
141	
142	
143	
150	
151	
210	

EMU's

302	X
303	X
304	X
305	X
307	X
308	X
309	X
310	X
311	X
312	X
313	X
314	X
315	X
317	X
318	X
319	X
504	X
507	X
508	X

411	X
412	X
413	X
414	X
415	X
416	X
419	
421	X
422	X
423	X
432	X
455	X
485	
486	
487	X
488	X
489	X
491	X

DEMU's

201	
202	
203	
204	
205	
207	

COACHING STOCK

Mk 1	
Mk 2, 2a-c	
Mk 2d-e	
Mk 2f	
Mk 2 DBSO	
Mk 3a	
Mk 3b	
Mk 3 (HST)	
Mk 3 SLE and SLEP	
Non Passenger	X

WORKSHOP OVERHAUL STANDARD SPECIFICATION 510/1

BATTERIES

Nickel Alkaline

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TOOLS AND MATERIALSBR CAT

Topping up gun (manual)		54/29022
Level testing tube		54/43002
Insulated box spanners:-	1/4"	98/7530
	3/8"	98/3772
	5/8"	98/3773
	7/8"	98/3774
	M10	98/7528
	M20	98/7529
Hydrometers:- 12" 1.100-1.300		54/42185
18" 1.100-1.300		54/42190
Thermometer 12-15" 0-50°C		39/66306
Voltmeter		
Rubber aprons:- 40" long with bib		44/3170
48" " " "		
Rubber gloves:- Size 7.5		44/115710
" 8.5		44/115711
" 9.5		44/115712
" 10.5		44/115713
Goggles		44/116120
		44/116152
Bottle brush 1.1/8" dia		5/1285
Petroleum jelly (terminals)		27/27000
Petroleum jelly (lid depression filling)		27/27001
Degreasing solvent (Sentisolve)		7/20322 25 litres
" " "		7/20323 205 litres
Paint Solvent (See data sheet) for chlor. rubber		28/6134
Paint remover - Nitromors type for polyurethane		28/60712
Boric acid		7/510
Eye wash solution 500 ml		34/1340
1000 ml		34/1342
Mounting bracket for solution bottle		11/26125
Topping up water		
Electrolyte S.G. 1.200		7/54691 5 litres
		7/54692 25 litres
Litmus paper, blue		7/58602
Litmus paper, red		7/58603
Chlorinated rubber paint:- Primer		28/5075
1st coat		28/5071
Finish coat (black)		28/5073
Bristle brush		5/3500

SECTION 1 REPAIR PROCEDURE

NOTES:-

1. Apron, goggles and gloves must be worn when working with cells or electrolyte.
2. Hydrometers used on lead acid cells must not be used on alkaline cells.
3. A stock of litmus papers should be held so that any contamination or spillage may be identified.

Red litmus will turn to blue on contact with alkali.
Blue litmus will turn to red on contact with acid.
4. Neutralise alkaline spillage with a solution of approx 1% boric acid to 99% water (1/4 cup to 1 gallon).
5. Do not smoke or bring naked lights in the vicinity of the battery.
6. Use insulated spanners on all connections. Do not lay tools on the cells.
7. Do not allow the cases of steel containered cells to touch each other.
8. Cells discarded during the Repair Procedure are to be returned to the manufacturer for repair.

1. Examination, Cleaning & Repair.

- 1.1 Disconnect connecting links and remove all nuts, bolts and washers from the terminals. Remove the cells from the crates.
- 1.2 Clean the connecting links, nuts, bolts and washers with hot, clean water and a bristle brush. Alternatively, items may be steeped in degreasing solvent and rinsed, collecting the washings for disposal.
- 1.3 Examine the connecting links, nuts, bolts and washers for damage and corrosion. Discard any defective items.
- 1.4 Seal each cell by closing the filler cap or inserting a rubber or plastic transit plug. Renew any caps which do not seal correctly.
- 1.5 Clean off dirt, grease and corrosion from the crates, cells and terminals using hot, clean water and a bristle brush. Wipe dry with clean cloth.
- 1.6 Examine each cell for the following defects. Take the specified action if defective.
 - 1.6.1 Distorted, fractured or corroded cell case: return cell to manufacturer for repair.

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- 1.6.2 Loose terminals: renew insulation washers.
- 1.6.3 Damaged terminals: return cell to manufacturer for repair.
- 1.6.4 Damaged or flaking paint. Proceed in accordance with Section 4 Additional Procedure 1. Do not paint stainless steel cell or plastic cases.
- 1.6.5 Alcad Nickel cells (not DMU's) dated between 1979-1983 painted in blue polyurethane: return to the manufacturer for refurbishment.
- 1.6.6 Electrolyte level considerably below the others.
- 1.7 Examine crates for defects and defective paintwork. If defective repair or re-paint the crate in accordance with Section 4 Additional Procedure 2.
- 1.8 Remove the filler caps/transit plugs.
- 1.9 Top up the electrolyte with topping-up water to the level given in Section 3 Table 2.
- 1.10 Renew any damaged filler caps. Renew any filler cap springs which do not have a snap action or have lose tension.
- 1.11 Check the stability of the electrolyte level for indication of leakage. If leakage is suspected remove the cell from the crate, dry it externally and stand it on dry paper. Discard the cell if wet patches appear.
- 1.12 Any cells or batteries which have had an electrolyte change request are to be dealt with in accordance with Section 4 Additional Procedure 3.

2. Charging

- 2.1 Using new connecting links, nuts, bolts and washers for those discarded or missing, connect the cells in series for charging. The number of cells will be dependant on the charging source, but battery units removed from the vehicles should whenever possible be kept together.
- 2.2 Display NO SMOKING - BATTERY ON CHARGE notices.
- 2.3 Charge the cells for 7 hours (10 hours if the electrolyte has been changed) at the constant current given in Section 3 Table 2.
- 2.4 Discard any cell whose internal temperature exceeds 45°C during the charge.
- 2.5 At the end of the period given in 2.2 measure the voltage of each cell with charging current still applied. Any cell with a reading below 1.6 V is to be returned to the manufacturer for repair.

- 2.6 Continue the constant current charge taking cell voltage readings at hourly intervals. Switch off the charging current when consecutive cell voltage readings become the same or after a total charging period of 12 hours, whichever is shorter.
- 2.7 Change the electrolyte in any cell (in accordance with Section 4 Additional Procedure 3) if the specific gravity is below 1.145. If one cell requires electrolyte change the other cells in the crate must be similarly treated.
- 2.8 Allow the battery to stand for 12 hours.
- 2.9 Measure the (open circuit) voltage of each cell. Any with a reading below 1.25 V is to be returned to the manufacturer for repair.
- 2.10 Replacement cells added at this stage are to be of a similar age and/or state of charge wherever possible.

3. Discharging

- 3.1 Discharge the battery at the constant current given in Section 3 Table 2 for 4 hours.
- 3.2 Measure the voltage of each cell. Any cell with a reading below 1.0 V is to be returned to the manufacturer for repair.
- 3.3 Charge the battery for 7 hours at the constant current given in Section 3 Table 2.
- 3.4 Disconnect the cells. Remove warning notices.

4. Final Attention

- 4.1 Any new cells used are to be treated in accordance with Section 4 Additional Procedure 4.
- 4.2 If the electrolyte has been changed delete the old date and stencil the month and year on the front end of the crate.
- 4.3 Top up the electrolyte with topping up water to the level give in Section 3 Table 2.
- 4.4 Fit all filler caps and dry all cell tops with a clean cloth.
- 4.5 Pour melted petroleum jelly (27/27001) into each cell top depression and fill up to the flange rim.
- 4.6 Coat the terminals with petroleum jelly (27/27000) applied with a brush.

- 4.7 Assemble the appropriate number of crates to form a battery
See Section 3 Table 1.

5. Storage

- 5.1 If the battery is not to be fitted immediately to a vehicle it is to be stored in a clean, dry area which must not be adjacent to lead acid batteries
- 5.2 Batteries must not be covered with plastic sheeting without ventilation.
- 5.3 If the battery is stored for longer than 3 months it is to be charged at the constant current give in Section 3 Table 2 until fully charged in accordance with para 2 before it is fitted to a vehicle.

SECTION 3 TECHNICAL DATA

Table 1 Vehicle Classes and Battery Details

Class	No of Cells	Type	BR Cat Nos.			Unit Construction
			Battery	Unit	Cell	
08	72	DL8	17/779	-	17/1081	9 cell crate
09	60	DL10	17/777	17/1083	17/1082	4 cell crate
26	72	DL15	61/13643	61/14901	61/14899	3 cell crate
27	72	DL15	61/19265	61/20655	61/14899	4 cell crate
81	72	ES5	90/814	90/12126	90/10623	6 cell crate
82						
85						
83	72	ES8	90/817	90/12127	90/10622	3 cell crate
86	72	VFS D13	90/50153	90/12096	90/4889	6 cell crate
87						
101	19	LR40	14/99701	14/99700	14/2792	2 cell crate
108						
Power Car	19	RV30	52/2974	52/2975	52/3964	2 cell crate
Trailer						
302-5	72	VF7 C15	93/810	93/12134	93/49751	3 cell crate
307-12						
313-18	72	VF5 D13	90/50153	90/12096	90/4889	6 cell crate
370	75	RVP5	98/1618	-	-	5 cell crate
Power Car	75	RV20	98/1836	-	-	3 cell crate (10) 5 cell crate (9)
Trailer						
411-14	46	VF5 D13	52/3402	52/3967	90/4889	4 cell crate (11) 3 cell crate (1)
415-16 (part)						
421-23						
415-16 (part)	47	ES6	53/3571	53/3732	53/3730	4 cell crate
432	46	VF7 C18	53/3539	53/3731	53/3729	3 cell crate
437						
455	72	VF5 D13	90/50153	90/12096	90/4889	6 cell crate
507-8						
487	19	VF7 C18	52/3986	-	53/3729	4 cell crate (4) 2 cell crate (2)
488						
504	72	VF7 C15	93/810	93/12134	93/49751	3 cell crate
GUV	19	YF7 B17	52/481	52/3968	52/3963	3 cell crate

TABLE 2 Charging Rates and Electrolyte Levels

Maker	Type	Capacity at 5 hr Rate (Ah)	Constant Current Charge & Discharge (A)	Electrolyte S.G.		Max Electrolyte Level Above Plate (mm)
				New	Minimum	
Marathon Alcad Ltd	BN12H	295	60	1.200	1.145	50
	DL8	85	17			
	DL10	100	20			
	DL15	155	31			
	ES4	40	8			
	ES5	55	11			
	ES6	60	12			
	ES8	85	17			
	ES12	125	25			
	LR40	400	80			
	MP50	50	10			
	RVP5	50	10			
	RV10	95	20			
	RV20	200	40			
	RV30	295	60			
	UHP80	80	16			
	VF7B17	125	25	1.180	1.145	25
	VF5D13	40	8			40
	VF7C15	80	16			56
	VF7C18	100	20			60
					65	
					65	
					70	
					50	
					110*	
					110*	
					110*	

*When using new electrolyte, fill to 50 mm. The remaining capacity is filled with topping-up water. This will reduce the specific gravity to the correct value.

3. Specification for Topping-Up Water

- 3.1 The water is to be either distilled or de-ionised.
- 3.2 The impurity of the water must not exceed 20 Dionic Units, or must not exceed the following conditions by chemical analysis.
 - 3.2.1 Total solids 20 p.p.m.
 - 3.2.2 Calcium oxide 10 p.p.m.
 - 3.2.3 Magnesium 10 p.p.m.
 - 3.2.4 Iron oxide 10 p.p.m.
 - 3.2.5 Lead 10 p.p.m.
 - 3.2.6 Chloride (expressed as chlorine) 10 p.p.m.
 - 3.2.7 Oil 10 p.p.m.
- 3.3 The water is to be clear and free from suspended matter.

Table 4 Marathon Alcad Date Codes

4.1 Cells Manufactured Prior to 1970

First letter indicates the quarter of the year of manufacture:

C	J	S	W
April	July	October	January

The last two digits indicate the year of manufacture, either by a number and a letter or two letters:

C	U	M	B	E	R	L	A	N	D
1	2	3	4	5	6	7	8	9	0

eg. C5R or CER = April-June 1956.

4.2 Cells Manufactured 1970 - 1979

First letter indicates year of manufacture. Second and third indicate the week of the year:

C	U	M	B	E	R	L	A	N	D
1	2	3	4	5	6	7	8	9	0

eg. CUM = 1971, 23rd week.

4.3 Cells Manufactured 1980 Onwards

Four letters indicating year and week of manufacture:

C	U	M	B	E	R	L	A	N	D
1	2	3	4	5	6	7	8	9	0

eg. AUBE = 1982, 45th week.

SECTION 4 ADDITIONAL PROCEDURES

1. Re-painting of Cell Cases

1.1 Determine the case material:-

1.1.1 Stainless steel or plastic do not require painting.

1.1.2 Mild steel coated with blue polyurethane paint - return cell to manufacturer for re-canning with stainless steel.

1.1.3 Nickel plated steel coated with chlorinated rubber paint - proceed as follows.

NOTE: See Safety Data BR2307 Sheet 28/1-2-3 for the following procedure.

1.2 Remove the damaged coating using the appropriate solvent.

1.3 Wash off all solvent with warm water.

1.4 Re-coat the stripped areas.

2. Re-painting of Crates

2.1 Crates not previously painted may be dipped in wax at 85°C for 30 minutes.

2.2 Alternatively, for crates previously painted or varnished, proceed as follows.

2.2.1 Remove or mask identification labels.

2.2.2 Apply 2 coats of chlorinated rubber paint.

2.2.3 Refit or unmask identification labels.

3. Changing Electrolyte

- 3.1 Obtain correct electrolyte - see Tools and Materials and Section 3 Table 2.
- 3.2 Place the cells in correct polarity sequence on an insulated surface so that the cases do not touch one another.
- 3.3 Connect the cells in series to a variable resistor.
- 3.4 Discharge the battery at the constant current rate given in Section 3 Table 2. Remove cells from the battery as their voltage reaches 0.8 V.
- 3.5 When disconnected, pour out the electrolyte from each cell and leave the case inverted to drain for a period not exceeding 20 minutes. Discard the electrolyte in accordance with local instructions.
- 3.6 Stand the cells upright and fill with new electrolyte to the level given in Section 3 Table 2. Some cells will require an addition of topping-up water to reduce the specific gravity - see note to Table 2.
- 3.7 Charge, discharge and recharge the cells in accordance with Section 1, parts 2 and 3.

4. Preparation of New Cells

- 4.1 Remove any packing, sealing tape and transit plugs. Retain transit plugs for future use.
- 4.2 Top up the electrolyte with topping-up water to the level given in Section 3 Table 2.
- 4.3 Fit filler caps.
- 4.4 Connect the cells in series and charge at the constant current given in Section 3 Table 2 for 10 hours.